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AUTHOR Crawford, Alan N.
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ABSTRACT

A readability formula for elementary Spanish instructional materials was developed by building on previous research, particularly in regard to the application of the Fry readability graph to Spanish language materials. The study began with the selection of average sentence length and number of syllables per 100 words as independent variables. Sample 100-word passages were selected from each grade level of ten different basal reader series used in the United States, Latin America, and Spain. The mean and standard deviation for average sentence length and number of syllables per passage were tabulated, and multiple regression analyses were performed for each series. Grade level was the dependent variable. A formula was derived from the analyses, and a readability graph was generated by computer to eliminate the computation and simplify use of the procedure. It is suggested that the formula and graph provide a procedure as convenient for Spanish as the Fry graph is for English, and that it can serve as a guide for writing elementary level instructional materials in Spanish and for teachers in selecting materials. Several tables detailing the data analysis are included in the text. (MSE)

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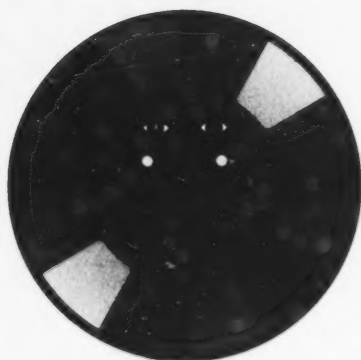
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Bilingual Education PAPER SERIES

A SPANISH LANGUAGE FRY-TYPE
READABILITY PROCEDURE:
ELEMENTARY LEVEL

Alan N. Crawford
California State University
Los Angeles



Evaluation, Dissemination
and Assessment Center
California State University, Los Angeles
5151 State University Drive
Los Angeles, CA. 90032

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A SPANISH LANGUAGE FRY-TYPE READABILITY PROCEDURE: ELEMENTARY LEVEL

Alan N. Crawford

Several useful formulas and graphs have been developed for assessing the level of difficulty of English language reading materials, most of them having been carefully evaluated and shown to be reasonably valid and reliable. Several procedures also exist for assessing the level of difficulty of Spanish language materials. Most of these, however, either are very cumbersome or they are based on extrapolations from procedures used in English, usually the Fry readability graph (Fry, 1968, 1977).

Purpose of the Study

The purpose of this study was to develop a valid and reliable, yet easily used, procedure to assess the readability of elementary level materials in Spanish.

Review of Related Literature

The first attempt to develop such a procedure was completed by Spaulding (1951). Using material from foreign-language qualifying examinations, Spaulding gathered data reflecting the internal elements of average word and sentence lengths, average frequency index of words according to Buchanan's list (a list of common Spanish words), and passage density (a measure of contextual support). Rank-difference correlations among these five variables and rankings of the difficulty of the passages by judges were then computed. When correlated with the criterion measure, variables of average sentence length and either density or corrected frequency index on the Buchanan list yielded

the highest correlation coefficients, .768, .620, and .688, respectively. The reliability coefficients of the two resulting formulas ranged from .87 to .90. Although time-consuming because of the need to determine the frequency of words on the Buchanan list, the formulas were reliable measures of the relative difficulty of Spanish reading materials.

In a later investigation, Spaulding (1956) further developed the formula which was based on the factors of average sentence length and density. This study included a graph permitting determination of a readability score without computation; but looking up each word on a lengthy Density Word List remained a complicated and time-consuming task. A companion rating scale allowed for evaluation of the readability score on a scale ranging from primer level to exceptionally difficult.

Spaulding's procedure was elaborated by Patterson (1972) in a monograph written in Spanish and designed for use by religious workers to simplify written materials for readers with low level skills. Thonis (1976) used Patterson's descriptions of the reading ability levels needed to deal with material yielding various indices on Spaulding's formula to establish grade levels, as determined by different categories of scores. The process of determining the grade levels was not described, and they should probably be used with some caution.

Subsequent work on readability in Spanish has been based for the most part on the Fry (1968) readability graph for English. Fry's graph was based on the number of sentences and syllables per 100 words. Correlations between readability indices yielded by the Fry graph and other widely used readability formulas ranged from .78 to .98. The graph was later validated at the primary level (Fry, 1969) and extended by extrapolation through the college level (Fry, 1977). Although the graph is simple to use, the readability indices it

yields correspond closely to those determined by other more complicated and time-consuming formulas.

The first attempt to use the Fry readability graph to determine readability in Spanish was a study conducted by Garcia (1977). He first provided evidence that longer words and sentences, the factors used on the Fry readability graph, are more difficult to comprehend in Spanish than shorter ones. He next determined the average number of syllables and average sentence length per one hundred words on each grade level of a basal reader series in Spanish. He then changed the corresponding numbers on the x and y axes of the Fry readability graph to reflect his findings, a process seemingly without a sound statistical basis. Although he gathered data from books only from primer through third-grade level, his resulting graph extended through college level. The changes made on the graph beyond the third-grade level must have been made on the basis of extrapolation; the actual method was not described.

A different approach to adapting the Fry readability graph to Spanish was used in a study by Gilliam, Pena, and Mountain (1980). They applied the same rules used in English to determine readability levels with the Fry readability graph to 13 texts and 9 juvenile books written in Spanish. They found that by subtracting 67 syllables from the average syllable count on a Spanish language passage, they would arrive at the same readability index indicated by the publisher or at that of an English language translation of the same material. An assumption (which they recognized) was that the readability of material does not change in translation. Another assumption was that the grade level indicated by publishers was accurate, despite the fact that apparently publishers of Spanish language basal readers have not reported the use of readability procedures to place or sequence materials.

Vari-Cartier (1981) adapted the Fry readability graph for use at the secondary level. The graph was based on correlations of Fry data with scores from cloze and multiple choice tests on eight selected passages in Spanish. It was designed to determine beginning, intermediate, advanced intermediate, or advanced levels of difficulty for secondary materials.

Rodriguez-Trujillo (1980) described a formula developed through multiple regression analysis by the Ministry of Education of Venezuela. The resulting formula was expressed as follows:

$$\text{Readability} = 95.2 - (9.7 \times L/W) - (.035 \times W/S)$$

where L = number of letters
 W = number of words
 S = number of sentences

This formula was validated at the sixth-grade level through use of cloze passages. Other details of the development process were not described.

Procedure

The two independent variables selected for this study were average sentence length and number of syllables per 100 words. Average sentence length was selected because of the high correlations between this variable and the opinions of judges in the Spaulding (1951) study. Although density correlated more highly with the opinions of judges than word length in the Spaulding study, syllable number per 100 words was nonetheless selected as the second variable because of the speed and greater ease of its determination.

Sample 100-word passages were selected at 10- to 15-page intervals from each grade level of ten different basal reader series used in the United States, Latin America, and Spain (see Appendix). The number of sample passages from each series is indicated in Table 1. The average sentence length and number of syllables per 100 words were tabulated by native Spanish-

Table 1

MULTIPLE REGRESSION ANALYSIS DATA

Series	Grade levels	N	Coefficient of determination	r with sentences/100 words	r with syllables/100 words	Standard error of estimate
Aguayo	1-5	96	.487	.680	.499	1.31
Continental	1-5	61	.440	.635	.423	1.31
Economy	1-3	87	.483	.589	.576	.59
Laidlaw	1-6	186	.489	.570	.537	1.14
Minerva	1-5	49	.671	.819	.288	.79
N. Sem	1-5	66	.437	.608	.456	.98
Santillana	1-2	60	.686	.757	.558	.29
Santillana	1-6	89	.377	.606	.271	1.32
SEP	1-6	73	.228	.443	.272	1.47
Voluntad	1-2	22	.511	.688	.272	.36

N = number of 100 word samples

Coefficient of determination: indication of accuracy of regression equation; 1.0 is the highest possible coefficient.

r with sentence length: correlation of number of sentences/100 words with grade level; 1.0 is the highest possible positive correlation.

r with syllables: correlation of number of syllables/100 words with grade level; 1.0 is the highest possible positive correlation.

Standard error of the estimate: 68% of predictions from regression equation will be within this factor of actual grade level.

speaking research assistants. The mean and standard deviation for average sentence length and number of syllables per 100 words for each grade level of book in each series were then calculated. The average sentence length of each passage was converted to number of sentences per 100 words for the multiple regression analysis so that the resulting formula would include this more easily determined factor. Multiple regression analyses were then performed for each of the ten series. The numbers of sentences and syllables per 100 words in each passage were used as independent variables and the grade levels indicated by the publishers as the dependent variable.

Analysis of the Data

The independent variables of average sentence length and average number of syllables per 100 words were tabulated first in ascending order of grade level within each series (Table 2). Average sentence length progressed fairly consistently from one grade level to the next within most of the series. Average sentence length, however, did drop from grade level five to six in the *Nuevo Sembrador* series, and little variation was seen among grade levels in the series used in Mexico, which is labeled SEP. The range of values in standard deviations indicated that most passages consisted of a mix of short and long sentences. The increase in number of syllables per 100 words from one level to the next within each series was less consistent than that of average sentence length.

Data on the independent variables were also presented by grade level for each series (Table 3). It was here that the lack of agreement over levels of difficulty among publishers of Spanish language basal reader materials was most apparent. Within each grade level, the range of differences in average sentence length in each series extended from about 6 to 19 words; for example,

Table 2
SUMMARY OF INDEPENDENT VARIABLES BY SERIES

Series	Book	Grade Level	$\bar{X}$ Sentence Length ^a	S.D.	$\bar{X}$ Syllables ^b	S.D.
Aguayo	Lectura 1	1	7.2	1.7	176.4	11.8
	Lectura 2	2	11.0	3.1	179.8	10.0
	Lectura 3	3	17.3	6.7	193.2	12.7
	Lectura 4	4	20.6	6.6	191.0	11.9
	Lectura 5	5	22.4	7.1	196.7	13.4
Continental	Amanecer	1	8.0	2.7	181.7	11.3
	Primeras luces	2	16.5	8.3	189.6	20.5
	Nosotros	3	17.1	4.2	188.9	11.6
	Curiosidades y ejemplos	4	19.0	7.7	201.0	11.7
	Cultura y espíritu	5	23.0	7.4	215.6	12.7
	Continente	6	24.7	4.6	207.0	11.2
Economy	All	1	7.5	1.5	175.1	11.6
	Mi mundo	2-1	9.6	1.3	182.5	11.9
	Nuestra alegría	2-2	10.0	1.9	188.3	10.9
	Mi rincón	3-1	11.4	2.1	192.7	9.8
	Nuestros sueños	3-2	15.3	6.7	198.6	15.1
Laidlaw	Nuestros amigos	1	6.9	1.4	177.3	8.6
	Del campo al pueblo	2-1	8.7	1.4	180.2	8.8
	Aventuras maravillosas	2-2	10.1	1.3	185.1	10.6
	Conozcamos a Puerto Rico	3-1	11.2	2.7	186.8	9.3
	Por tierras vecinas	3-2	14.8	3.8	190.0	10.7
	Por los caminos del mundo	4	12.4	4.0	190.5	14.9
	Misterios de la tierra y del espacio	5	12.2	3.6	199.4	12.4
	Una mirada al pasado	6	18.1	4.9	199.7	11.1
	Páginas de ayer	6	13.8	4.6	198.2	13.1
Minerva	Lectura 1	1	5.2	.4	168.3	10.0
	Lectura 2	2	8.0	1.5	179.5	9.3
	Lectura 3	3	13.9	3.6	192.6	7.2
	Lectura 4	4	16.3	3.3	207.8	13.6
	Lectura 5	5	18.9	5.3	200.8	17.7
Nuevo Sembrador	Lectura 1	1	5.0	.7	191.6	6.7
	Lectura 2	2	13.4	4.2	188.8	6.2
	Lectura 3	3	15.4	4.4	193.9	12.7
	Lectura 4	4	22.2	10.7	199.4	19.7
	Lectura 5	5	19.8	7.6	207.1	11.6

^a $\bar{X}$ sentence length = $\bar{X}$ words per sentence

^b $\bar{X}$ syllables = $\bar{X}$ syllables per 100 words

Table 2 (continued)

Series	Book	Grade Level	$\bar{X}$ Sentence Length ^a	S.D.	$\bar{X}$ Syllables ^b	S.D.
Santillana	Mira y lee	1-1	3.6	.7	166.5	8.2
	Lee y trabaja	1-2	5.5	.7	160.5	12.4
	Trabaja y aprende	1-3	6.8	.7	169.3	7.2
	La ciudad	2-1	11.4	3.5	173.8	11.7
	Otros amigos, otras culturas	2-2	11.7	3.8	179.8	10.9
Santillana	Rayuela	1	9.0	2.0	187.7	9.9
	Adelante	2	9.1	1.9	186.8	10.1
	Imágenes	3	10.9	2.4	194.4	13.7
	Quetzalcoatl y los vientos	4	13.2	7.0	185.6	12.6
	Nuestra Herencia Literaria I	5	15.8	4.5	194.9	10.5
	Nuestra Herencia Literaria II	6	20.8	7.5	197.4	11.4
SEP	Español 1	1	12.7	2.0	181.0	10.3
	Español 2	2	12.2	5.0	188.4	24.6
	Español 3	3	13.3	2.5	189.4	13.0
	Español 4	4	17.1	4.6	187.7	6.8
	Español 5	5	17.8	6.3	192.8	9.6
	Español 6	6	19.3	8.0	189.9	18.0
Voluntad	Alegría a leer	1-1	6.9	1.8	186.2	5.8
	Manantial	1-2	9.7	7.6	176.2	24.8
	Alegría a leer	2	27.2	14.3	189.5	9.0

^a $\bar{X}$ sentence length = $\bar{X}$ words per sentence

^b $\bar{X}$ syllables = $\bar{X}$ syllables per 100 words

Table 3

SUMMARY OF INDEPENDENT VARIABLES BY GRADE LEVEL

Series	Book	Grade Level	$\bar{X}$ Sentence Length ^a	S.D.	$\bar{X}$ Syllables ^b	S.D.
Aguayo	Lectura 1	1	7.2	1.7	176.4	11.8
Continental	Amanecer	1	8.0	2.7	181.7	11.3
Economy	All	1	7.5	1.5	175.1	11.6
Laidlaw	Nuestros amigos	1	6.9	1.4	177.3	8.6
Minerva	Lectura 1	1	5.2	.4	168.3	10.0
N. Sembrador	Lectura 1	1	5.0	.7	191.6	6.7
Santillana	Mira y lee	1-1	3.6	.7	166.5	8.2
Santillana	Lee y trabaja	1-2	5.5	.7	160.5	12.4
Santillana	Trabaja y aprende	1-3	6.8	.7	169.3	7.2
Santillana	Rayuela	1	9.0	2.0	187.7	9.9
SEP	Español 1	1	12.7	2.0	181.0	10.3
Voluntad	Alegría a leer	1-1	6.9	1.8	186.2	5.8
Voluntad	Manantial	1-2	9.7	7.6	176.2	24.8
Aguayo	Lectura 2	2	11.0	3.1	179.8	10.0
Continental	Primeras luces	2	16.5	8.3	189.6	20.5
Economy	Mi mundo	2-1	9.6	1.3	182.5	11.9
Economy	Nuestra alegría	2-2	10.0	1.9	188.3	10.9
Laidlaw	Del campo al pueblo	2-1	8.7	1.4	180.2	8.8
Laidlaw	Aventuras maravillosas	2-2	10.1	1.3	185.1	10.6
Minerva	Lectura 2	2	8.0	1.5	179.5	9.3
N. Sembrador	Lectura 2	2	13.4	4.2	188.8	6.2
Santillana	La ciudad	2-1	11.4	3.5	173.8	11.7
Santillana	Otros amigos...culturas	2-2	11.7	3.8	179.8	10.9
Santillana	Adelante	2	9.1	1.9	186.8	10.1
SEP	Español 2	2	12.2	5.0	188.4	24.6
Voluntad	Alegría a leer	2	27.2	14.3	189.5	9.0
Aguayo	Lectura 3	3	17.3	6.7	193.2	12.7
Continental	Nosotros	3	17.1	4.2	188.9	11.6
Economy	Mi rincón	3-1	11.4	2.1	192.7	9.8
Economy	Nuestros sueños	3-2	15.3	6.7	198.6	15.1
Laidlaw	Conozcamos a Puerto Rico	3-1	11.2	2.7	186.8	9.3
Laidlaw	Por tierras vecinas	3-2	14.8	3.8	190.0	10.7
Minerva	Lectura 3	3	13.9	3.6	192.6	7.2
N. Sembrador	Lectura 3	3	15.4	4.4	193.9	12.7
Santillana	Imágenes	3	10.9	2.4	194.4	13.7
SEP	Español 3	3	13.3	2.5	189.4	13.0

^a $\bar{X}$ sentence length = $\bar{X}$ words per sentence^b $\bar{X}$ syllables = $\bar{X}$ syllables per 100 words

Table 3 (continued)

Series	Book	Grade Level	$\bar{X}$ Sentence Length ^a	S.D.	$\bar{X}$ Syllables ^b	S.D.
Aguayo	Lectura 4	4	20.6	6.6	191.0	11.9
Continental	Curiosidades	4	19.0	7.7	201.0	11.7
Laidlaw	Por los caminos del mundo	4	12.4	4.0	190.5	14.9
Minerva	Lectura 4	4	16.3	3.3	207.8	13.6
N. Sembrador	Lectura 4	4	22.2	10.7	199.4	19.7
Santillana	Quetzalcoatl y los vientos	4	13.2	7.0	185.6	12.6
SEP	Español 4	4	17.1	4.6	187.7	6.8
Aguayo	Lectura 5	5	22.4	7.1	196.7	13.4
Continental	Cultura y espíritu	5	23.0	7.4	215.6	12.7
Laidlaw	Misterios de la tierra	5	12.2	3.6	199.4	12.4
Minerva	Lectura 5	5	18.9	5.3	200.8	17.7
N. Sembrador	Lectura 5	5	19.8	7.6	207.1	11.6
Santillana	Literaria I	5	15.8	4.5	194.9	10.5
SEP	Español 5	5	17.8	6.3	192.8	9.6
Continental	Continente	6	24.7	4.6	207.0	11.2
Laidlaw	Una mirada al pasado	6	18.1	4.9	199.7	11.1
Laidlaw	Páginas de ayer	6	13.8	4.6	198.2	13.1
Santillana	Literaria II	6	20.8	7.5	197.4	11.4
SEP	Español 6	6	19.3	8.0	189.9	18.0

^a $\bar{X}$ sentence length = $\bar{X}$ words per sentence

^b $\bar{X}$ syllables = $\bar{X}$ syllables per 100 words

it ranged from 8 words per sentence in the *Minerva* text at the second-grade level to 27.2 words per sentence in the *Voluntad* text at the same grade level. Similar variability was obvious in the average number of syllables per 100 words; the first-grade text from *Nuevo Sembrador* had a higher average number of syllables per 100 words than the sixth-grade-level text used in Mexico (SEP).

Multiple regression analyses were performed for each series sampled (Table 1). For several reasons, the data from the Laidlaw series were selected as the basis for developing the readability formula and graph. First, the Laidlaw series extended from first- through sixth-grade levels and the progression of increases of average sentence length and number of syllables per 100 words through these levels was quite regular. Second, the correlations of sentence number and syllables per 100 words with grade level indicated by publishers were well balanced in their contribution to the regression equation. Further, the standard error of the estimate was lower than in the other series which extended from first through sixth grades. Finally, because of the larger number of books and their greater length, this series provided the largest sample of material.

Development of the Readability Formula

The multiple regression analysis of data from the 186 Laidlaw series passages, shown in Table 1, yielded the following regression equation:

$$\begin{aligned} \text{Grade level} = & [\text{number of sentences per 100 words} \times (-.205)] \\ & + (\text{number of syllables per 100 words} \times .049) - 3.407 \end{aligned}$$

The formula can be applied by counting the number of sentences and syllables in a 100-word passage. The number of sentences should be rounded off to the nearest tenth. The following passage of 100 words was taken from the third-grade reader, *Nosotros*, in the *Serie Continental*:

Un perrito jugaba con su dueña. Le lamía las manos y le demostraba su cariño meneando la cola. Teníase en pie ante ella y todos los presentes le daban de las cosas que estaban comiendo. Un asno sin seso, que veía aquello, pensó para sí: Yo sirvo a mi dueña y a sus gentes con más provecho que mil perrillos como ese. Sobre mi espinazo traigo mucha leña del monte y la harina del molino, con la cual hacen el pan que comen, y nadie me halaga ni me regala. Pues entonces haré las mismas gracias que el perrito faldero.

It was determined that there were 7 sentences and 175 syllables in the 100-word passage.

$$\text{Grade level} = [7 \times (-.205)] + (175 \times .049) - 3.407 = 3.7$$

According to the formula, the passage was written at a high third-grade level.

Development of the Readability Graph

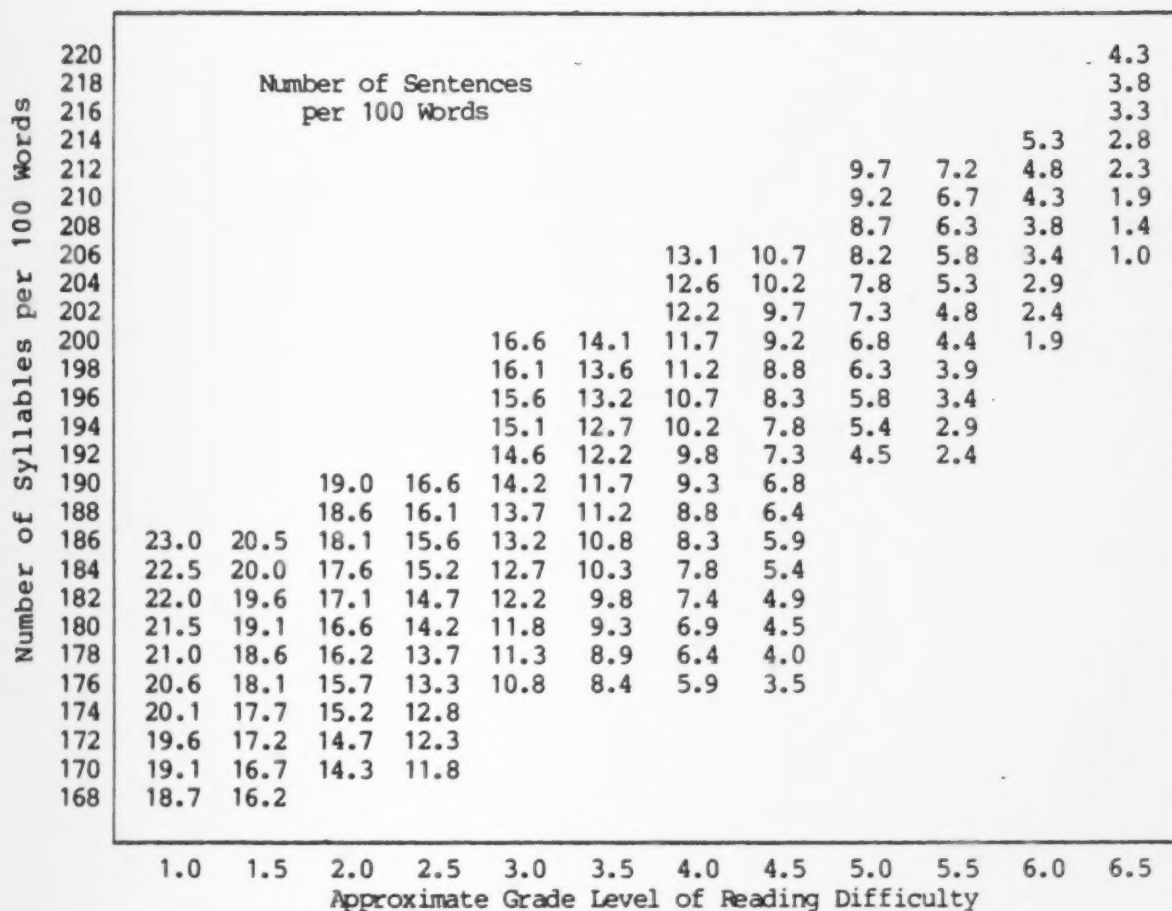
To eliminate the computation and simplify the use of the procedure, a readability graph (Figure 1) was constructed. A computer program was developed to generate all possible combinations of number of sentences and syllables per 100 words and their resulting readability indices. The limits of the combinations generated were set one standard deviation from the mean of each variable at each grade level. This eliminated from the graph the effect of extremes in sentence or word length, which might result in the identification of inappropriate passages.

Summary and Recommendations for Further Research

The formula and graph resulting from this study should provide a procedure as convenient to use in Spanish as is the Fry readability graph in English. The accuracy of readability indices yielded by the procedure should be viewed with the same caution as those from the Fry graph in English. This

Figure 1

SPANISH READABILITY GRAPH



Directions:

1. Count the first 100 words in the passage.
2. Count the number of sentences in the 100 words, rounding to the nearest tenth.
3. Count the number of syllables in the 100 words.
4. Locate the number of syllables in the left column of the graph. Look to the right of that number across the columns until you locate the number of sentences you counted. The number at the bottom of that column is the approximate grade level of the material.
5. If the material consists of more than a few pages, take several samples at regular intervals and use the average of each variable.
6. If the ratio of sentences to syllables per one hundred words does not appear in the graph, then you will not be able to determine the readability of the sample.

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graph should serve as a useful guide to authors attempting to write elementary level instructional materials in Spanish and to teachers selecting appropriate levels of materials from those already available.

Since there is presently no widely accepted standard for readability in the Spanish language, this formula and graph cannot be validated against an established criterion. It would be desirable, however, to assess the relationship of rankings of passages by the formula and graph to rankings of their comprehensibility to readers, perhaps as measured by cloze tests or some other reading comprehension measure. It would also be desirable to gather the same surface structure data from secondary level materials and extend the formula and graph through the twelfth grade.

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Appendix

SERIES UTILIZED IN
SPANISH READABILITY ANALYSIS

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Lectura en Dos Idiomas/Reading in Two Languages. Northvale, New Jersey: Santillana Publishing Company, Inc., 1980.
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Grades 1-6.

Español. México, D.F.: Secretaría de Educación Pública, 1980.
Grades 1-6.

Serie Continental. México, D.F.: Fernandez Editores, S.A., 1949 (1979).
Grades 1-6.

Serie Minerva de Libros de Lectura (Joaquín Añorga Larralde). New York: Minerva Books, Ltd., 1968.
Grades 1-5.

Serie Nacional de Libros de Lectura (Alfredo M. Aguayo). Bogotá: Cultural Colombiana, Ltda., 1974.
Grades 1-5.

Serie Santillana. New York: Santillana Publishing Company, 1972.
Grades 1-2.

Spanish Reading Keys (Dolores Rose Amato and Rogelio López del Bosque). Oklahoma City: The Economy Company, 1977.
Grades 1-3.

Alan N. Crawford is a Professor of Education at California State University, Los Angeles, and has taught at the Universidad Autónoma de Guadalajara as a visiting professor. His major areas of interest are reading and the language minority child, second language acquisition, and the use of computer technology in reading and the language arts. He is bilingual in English and Spanish.

Currently Vice President of the California Reading Association, Dr. Crawford will serve as President during the next year. He is also editor of the *AMAE Journal*, the journal of the Association of Mexican-American Educators.